

Work Order ID 84661

May-30-12 3:52:21 PM

Duplicate

84661

U/R

Page 1

Item ID: D350-748-141TRN

Accept

N900040100

Setup Start *NS1*

Revision ID: ~~U/R~~

Item Name: Crosstube Turning Detail

Stop *NS2*

Start Date: 17/05/2012 Start Qty: 1.00 *1*

Cust Item ID:

Required Date: 22/05/2012 Req'd Qty: 1.00 *1*

Customer:

Reference:

Approvals: Process Plan: MLJ Date: 12/05/13 Tooling:

Run Start *NR1*

QC: Date: SPC (Y/N):

Stop *NR2*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr	Revision Nbr
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D350-748-141	F U/R <i>OK</i> <i>Q12-0331</i>
--------------	---------------------------------

100	MORI SEIKI CNC LATHE LARGE	0.00
-----	----------------------------	------

100

Mori Seiki

Memo 0.00

Mori Seiki CNC Lathe Large

1-Fill tube with sand & install plugs on both ends as per Folio FA648

2-Turn first side as per Folio FA648

3- File transition lines smooth.

FOLIO REV: AF

DWG REV: E

110	QC1- Inspect dimensions to dimension sheet	0.00
-----	--	------

110

QC

Memo 0.00

Quality Control

1 6

1 0

mm L
12/09/23

mm L
12/09/23

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

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Run Start ***NR1***
Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
120		0.00							
120	MORI SEIKI CNC LATHE LARGE								
Mori Seiki	Memo	0.00							
Mori Seiki CNC Lathe Large	1-Turn second side as per Folio FA648 2- File transition lines smooth. 3-Scribe Part & Batch as per Dwg D350-748-141 FOLIO REV: <u>AA</u> DWG REV: <u>E</u>								
130		0.00							
130	QC1- Inspect dimensions to dimension sheet								
QC	Memo	0.00							
Quality Control									
140		0.00							
140	QC8- Inspect parts - second check								
QC	Memo	0.00							
Quality Control									

mm, l
12/09/23

mm, l
12/09/23

JW *12-9-25*

W/O:		WORK ORDER CHANGES					
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Run Start ***NR1***Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
150	Large Fab	0.00							
150									
Crosstubes	Memo	0.00							
Crosstubes	1-DRILL HOLES FOR HEAT TREAT USING DT9806(HOLES MUST BE ALIGNED ON SAME LINE ON BOTH CUFFS)								
	2-Grind machining marks								
160	Outsource process - Heat Treat	0.00							
160									
Outsource I	Memo	0.00							
Outsource process - Heat Treat	Issue P/O: <u>18083</u> Heat Treat to min 180 KSI As per Dwg D350-748-141 (MIL-T-6736 OR AMS 2759-1C) Sand Blast tube after Heat Treat Possible Supplier: Vac Aero Ensure Certificate of Conformity is attached								

RM 12-9-28
JW 12-9-26

CL 12/10/05 ①

W/O:		WORK ORDER CHANGES					
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QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Run Start ***NR1***

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

170

Receive & Inspect for Damage & Mat'l Certs

0.00

170

Packaging

Memo

0.00

Packaging

Ensure certificate of conformaty is attached

[Handwritten signature]

180

QC6- Inspect dimensions to drawing

0.00

180

QC

Memo

0.00

Quality Control

[Handwritten: DAS 16 17/11/30]

190

Packaging

0.00

190

Packaging

Memo

0.00

Packaging

Identify and stock in kanban rack
Location: *46*

[Handwritten: 12-12-18]

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Page 5

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QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Run Start ***NR1***
Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
200	QC21- Final Inspection - Work Order Release	0.00							
200									
QC	Memo	0.00							
Quality Control									

12/12/2012
U12.12.18

W/O:		WORK ORDER CHANGES					
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NOTE: Date & initial all entries

Picklist Print

May-30-12 3:52:24 PM

Page 1

Work Order ID: 84661

84661

Parent Item: D350-748-141TRN

D350-748-141TRN

Parent Item Name: Crosstube Turning Detail

Start Date: 17/05/2012

Required Date: 22/05/2012

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A New Issue 08-03-06 DD verified by:ec
 IPP Rev B Removed polish 08.04.02 EC verified by : DD
 IPP Rev C Remove LPS-3 08.06.23 EC verified by DD IPP Rev C
 11.02.24 as per dwg rev.F DD verf: JLM

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6015-125		Manufactured	No			110	Each	38.0000	1	1			

D6015-125

**

Crosstube Material

Location

Loc Qty

Loc Code

HALL

38

61380

4

7251Y

34

l mm/c 12/09/22

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

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NOTE: Date & initial all entries

DART AEROSPACE LTD	Work Order: 84661
Description: Crosstube Assembly (AS350/355 High Fwd)	Part Number: D350-748-141
Inspection Dwg: D350-748-141 Rev: F	Page 1 of 1

FIRST ARTICLE INSPECTION CHECKLIST

Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.240	+0.005/-0.000	2.242	✓	vern	CNC-08
	2.180	+0.005/-0.000	2.183	✓		
	2.180	+0.005/-0.000	2.184	✓		
	2.237	+0.005/-0.000	2.241	✓		
	2.272	+0.005/-0.000	2.277	✓		
	2.306	+0.005/-0.000	2.310	✓		
	2.339	+0.007/-0.000	2.344	✓		
	2.339	+0.007/-0.000	2.346	✓		
	0.062	+/-0.010	.062	✓	vern	CNC-08
	4.26	+/-0.030	4.26	✓	"	
	R0.063	+/-0.010	.063	✓	RG	
	R0.50	+/-0.030	.500	✓	"	
SIDE B	2.240	+0.005/-0.000			vern	CNC-08
	2.180	+0.005/-0.000				
	2.180	+0.005/-0.000				
	2.237	+0.005/-0.000				
	2.272	+0.005/-0.000				
	2.306	+0.005/-0.000				
	2.339	+0.007/-0.000	2.344			
	2.339	+0.007/-0.000	2.345	✓		
	0.062	+/-0.010	.062	✓	vern	CNC-08
	4.26	+/-0.030			"	
	R0.063	+/-0.010	.063	✓	RG	
	R0.50	+/-0.030			"	
	110.27	+/-0.060	110.27	✓	tape	LG-22

Measured by: mmc	Audited by: JW	Preliminary Approval:
Date: 12/09/22	Date: 12-9-25	Date:

Rev	Date	Change	Revised by	Approved
A	06.11.09	New Issue (P/O D350-748-101)	KJ/JLM	
B	07.10.24	Dwg Rev updated	KJ/EC/DD	
C	11.01.20	Dwg Rev updated	KJ	
D	11.07.26	Tolerance revised for 2.339 dimensions	KJ	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

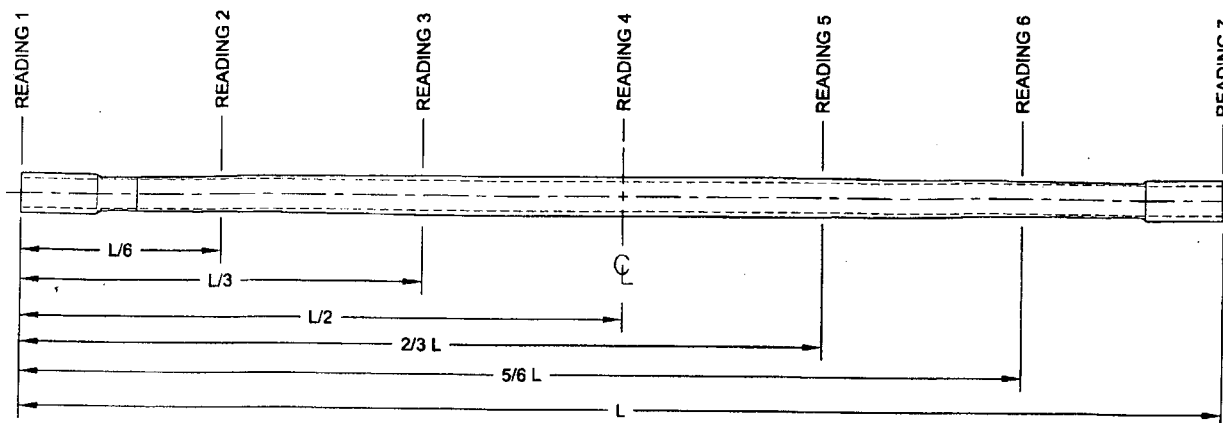
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NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order: 84661
Description: Crosstube Assembly (AS350/355 High Fwd)		Part Number: D350-748-141
Inspection Dwg: D350-748-141 Rev: F		Page 2 of 2

WALL THICKNESS MEASUREMENT



Location	WALL THICKNESS MEASUREMENT (IN)				Deviation Δw (max-min)	TOLERANCE
	w1	w2	w3	w4		
READING 1 L= 0"	.129	.135	.127	.122	.012	0.030"
READING 2 L= 11	.107	.115	.106	.100	.015	
READING 3 L= 22	.144	.156	.150	.136	.020	
READING 4 L= 55	.182	.181	.176	.179	.006	
READING 5 L= 72	.139	.159	.155	.133	.026	
READING 6 L= 11	.102	.115	.115	.099	.016	
READING 7 L= cuft	.123	.128	.128	.126	.005	

Calibration Result

Actual Block Thickness: .100 ~ .500

Sitiescan 250 Measured Thickness: .100 ~ .500

Measured by: <i>MMH</i> Date: 12/07/23	Audited by: <i>JW</i> Date: 12-9-25	Preliminary Approval: Date:
---	--	--

Rev	Date	Change	Revised by	Approved
A	06.11.09	New Issue (P/O D350-748-101)	KJ/JLM	
B	07.10.24	Dwg Rev updated	KJ/EC/DD	
C	11.01.20	Dwg Rev updated	KJ	
D	11.07.26	Tolerance revised for 2.339 dimensions	KJ	
E	12.06.04	Wall thickness form added	KJ	<i>[Signature]</i>

Item	Qty	Part Number	Description
	-141		
1	X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
2	1	D6015-125	CROSSTUBE (OR D6017-115)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

GENERAL NOTES:

- MATERIAL: MANUFACTURED FROM D6015-125 OR D6017-115
FINISHED LENGTH = 110.270±0.06
- FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- UNITS: INCHES UNLESS OTHERWISE NOTED.
- BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- IDENTIFICATION: DART PART NUMBER "D350-748-141" AND BATCH NUMBER ON INSIDE OF CUFF
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- WEIGHT: 30.45 lbs
- PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø.297 HOLE.
- BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE, CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.
- TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

SHOP COPY
RETURN TO
ENGINEERING
UNCONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER
NO. 84661 MLJ
12/05/31

UNDER REVIEW

11.07.12

RELEASED
2011-01-18

F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT ADD STANDARDS; RELOCATED FLAG #8 PER PAR 08-046 (ZN A6-3); TOLERANCES (ZN C6-3, D1-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6017-115 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN			
DRAWN			
CHECKED			
MFG. APPR.			
APPROVED			
DE APPR.			
DATE	10.11.23		

DART AEROSPACE LTD
HAWKESBURY, ONTARIO, CANADA

REV. F
DRAWING NO.
D350-748-141
SHEET 1 OF 4
TITLE
CROSSTUBE (AS 350/355 HI FWD)
SCALE
NTS

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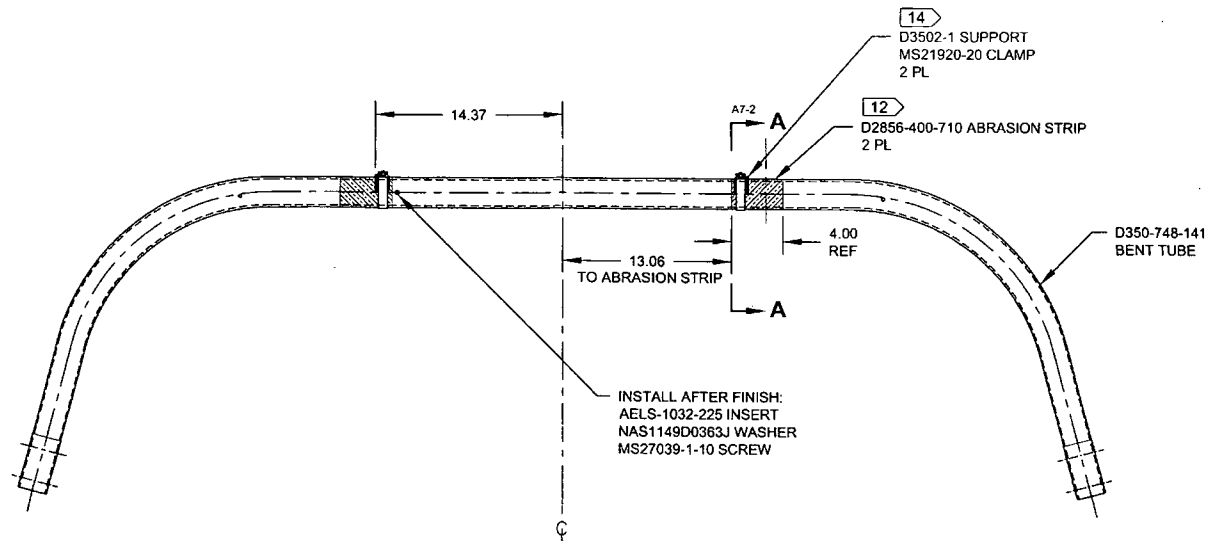
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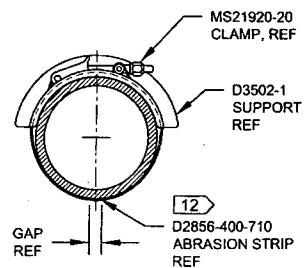
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries







**D350-748-141
ASSEMBLY DETAIL**



SECTION A-A D4-2
SCALE 4X

UNDER REVIEW

RELEASED
2011-01-18

DESIGN	99	DART AEROSPACE LTD	
DRAWN	99	HAWKESBURY, ONTARIO, CANADA	
CHECKED		DRAWING NO.	REV. F
MFG. APPR.		D350-748-141	SHEET 2 OF 4
APPROVED		TITLE	SCALE
DE APPR.		CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	COPYRIGHT © 2005 BY DART AEROSPACE LTD	
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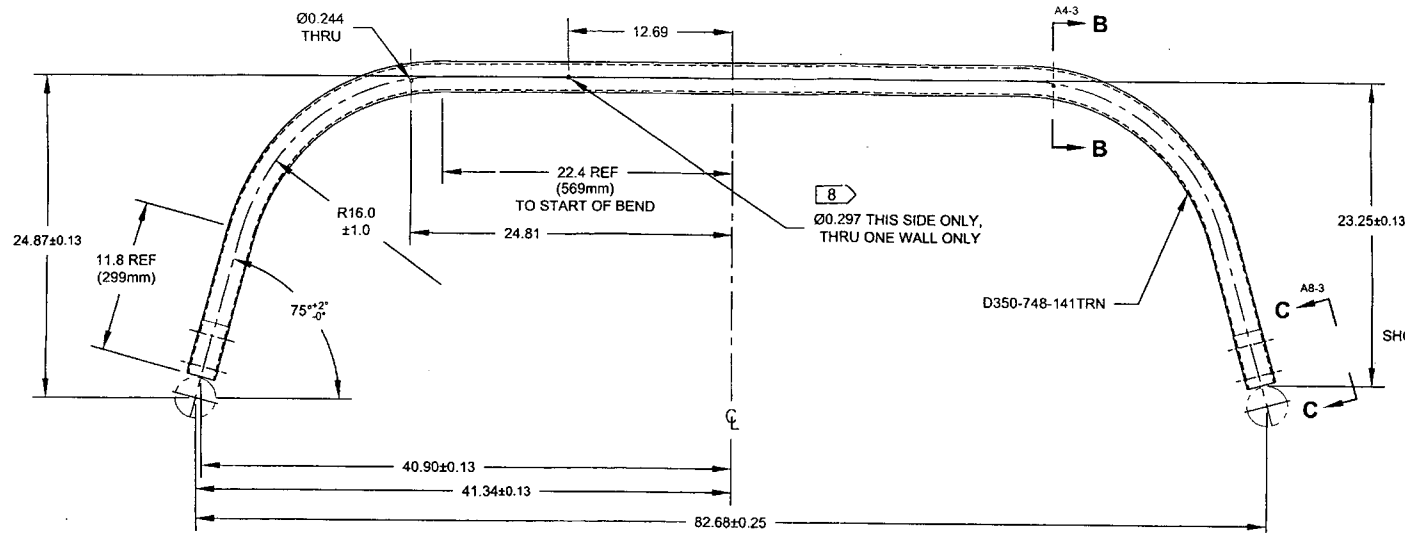
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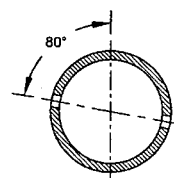
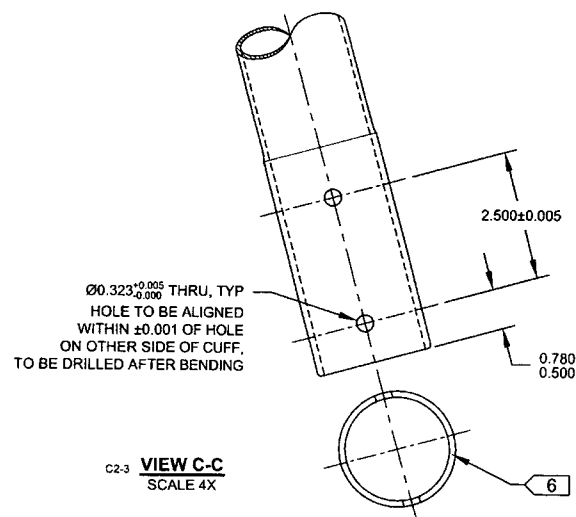
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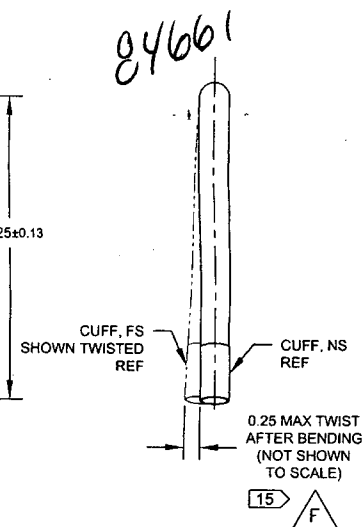
NOTE: Date & initial all entries



D350-748-141
BENDING AND DRILLING DETAIL 10



SECTION B-B D3-3
SCALE 4X



UNDER REVIEW

11.27.12

RELEASED
2011-01-18

DESIGN	DP	DART AEROSPACE LTD	
DRAWN	DP	HAWKESBURY, ONTARIO, CANADA	
CHECKED	B	DRAWING NO.	REV. F
MFG. APPR.	C	D350-748-141	SHEET 3 OF 4
APPROVED	H	TITLE	SCALE
DE APPR.	H	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR DISSEMINATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD</small>	

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DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

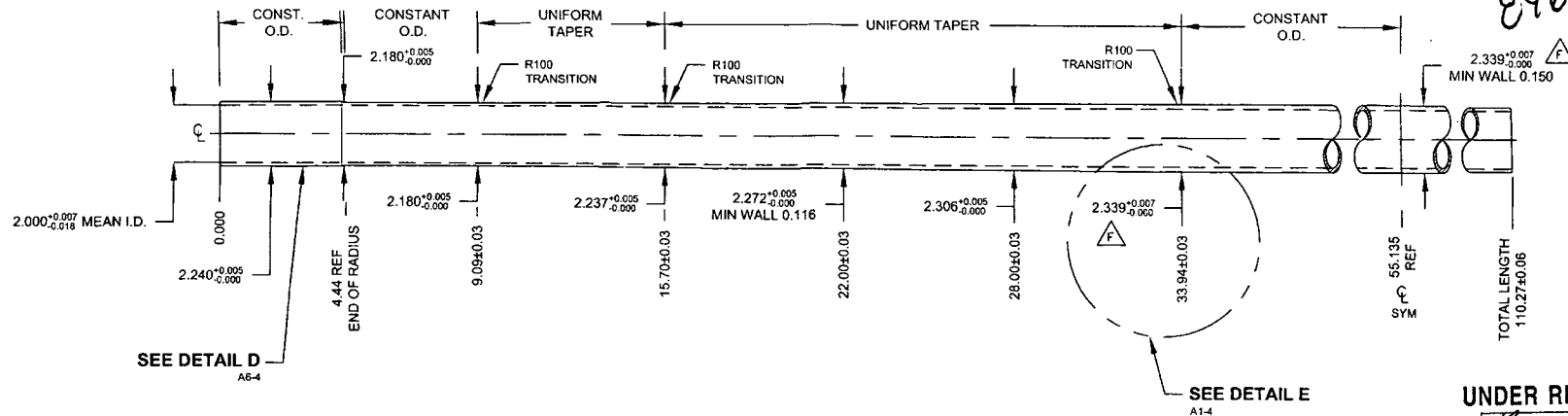
Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

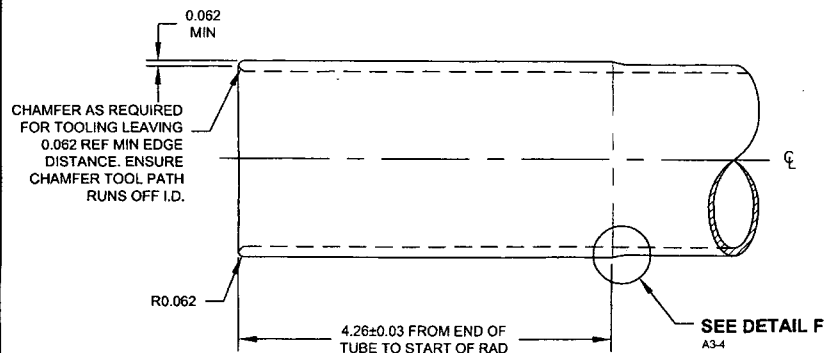
NOTE: Date & initial all entries

8 7 6 5 4 3 2 1

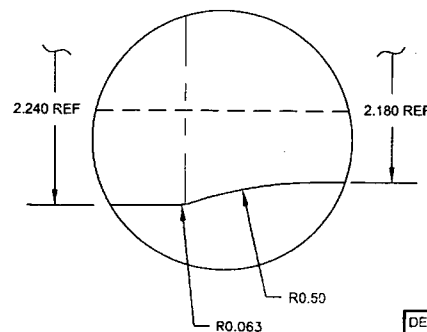


**D350-748-141TRN
TURNING DETAIL**

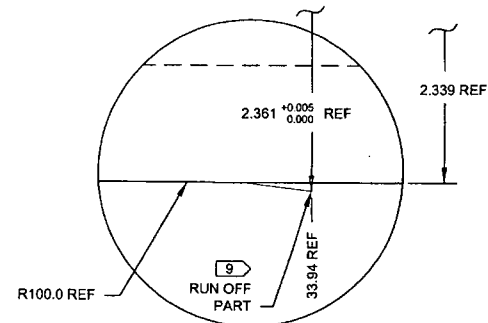
UNDER REVIEW
11.07.12



**DETAIL D:
CROSSTUBE CUFF** C7.4
SCALE 3X



**DETAIL F:
CUFF TRANSITION** A5.4
NOT TO SCALE



**DETAIL E:
TAPER RUN-OFF** C3.4
NOT TO SCALE

RELEASED
2011-01-18

DESIGN	9P	DART AEROSPACE LTD	
DRAWN	9P	HAWKESBURY, ONTARIO, CANADA	
CHECKED	JS	DRAWING NO.	REV. F
MFG. APPR.	E	D350-748-141	SHEET 4 OF 4
APPROVED	JS	TITLE	SCALE
DE APPR.	JS	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	COPYRIGHT © 2005 BY DART AEROSPACE LTD	
THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE, OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.			

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Packing List

Sales Order Number:

74295

Sales Order Date

Oct 16, 2012

Page:

1

B
10 E. MERMAID LANE
WYNDMOOR, PA 19038

Voice: 215-233-2600
Fax: 215-233-5653

Sold To:
DART AEROSPACE
1270 ABERDEEN STREET
HAWKESBURY, ON K6A 1K7

Ship To:
DART AEROSPACE
1270 ABERDEEN STREET
HAWKESBURY, ON K6A 1K7

Customer ID	PO Number	Payment Terms
DARA	PO18083	Net 30 Days
Ship Via	Process	
CALL CUSTOMER	HT	

Quantity	Item	Description	Total Shipped	This Shipment
16.00	EACH	E350-748-141TRN CROSSTUBE HEAT TREAT TO MIN 180 KSI (MIL-T-6736 OR AMS 2759-1C) SANDBLAST TUBE AFTER HEAT TREAT 260 POUNDS TOTAL		
1.00	CERT.			

COMMENTS

SHIPPED BY, SIGNATURE
METLAB

DATE

RECEIVED BY, SIGNATURE
DART AEROSPACE

DATE



1000 E. Mermaid La., Wyndmoor (Phila.) PA 19038-8093
Tel. (215) 233-2600 Fax (215) 233-5653

Certification

SOLD TO

Dart Aerospace Ltd.
1270 Aberdeen Street
Hawkesbury, ON K6A 1K7

November 13, 2012

Metlab Shop Order No:	74295
Purchase Order:	P018083
Description:	Crosstube
Part No.:	E350-748-141TRN
Quantity:	16 Pieces
Weight:	260 Pounds
Material:	4130 Alloy Steel
Specifications:	Heat Treat to Minimum 180 KSI (MIL-T-6736 OR AMS 2759-1C). Sandblast tube after heat treat.

This is to certify that the above parts were processed as indicated above and conform to the specification requirements.

Results:

Hardness: HRC 40-42 (180-192 ksi converted)

METLAB

Quality Representative


J.G. Conybear

MERCURY CONTAMINATION: During the heat treating process, testing and inspections, the product did not come in direct contact with mercury or any of its compounds nor with any mercury containing device.



Heat Treating and Metallurgical Consulting

D 350 X-TUBE CUFF MEASURMENTS AFTER HEAT TREATING

	TYPE	BATCH #	SIDE A TWO READINGS	SIDE B TWO READINGS
1	AFT	90671	2.251"/20238"	2.238"/2.243"
2	AFT	90670	2.235"/2.247"	2.236"/2.250"
3	AFT	90675	2.220"/2.261"	2.235"/2.257"
4	AFT	90672	2.239"/2.264"	2.240"/2.242"
5	AFT	90676	2.238"/2.240"	2.247"/2.254"
6	AFT	90674	2.238"/2.245"	2.242"/2.258"
7	AFT	90688	2.239"/2.251"	2.238"/2.247"
8	AFT	90677	2.242"/2.247"	2.238"/2.256"
9	AFT			
10	AFT			
11				
12	FWD	84664	2.234"/2.249"	2.209"/2.274"
13	FWD	86273	2.227"/2.261"	2.195"/2.258"
14	FWD	84665	2.239"/2.245"	2.214"/2.276"
15	FWD	84654	2.210"/2.275"	2.246"/2.249"
16	FWD	84661	2.246"/2.254"	2.193"/2.287"
17	FWD	84663	2.212"/2.272"	2.247"/2.252"
18	FWD	86272	2.266"/2.212"	2.243"/2.253"
19	FWD	84662	2.209"/2.269"	2.242"/2.254"
20	FWD			
21	FWD			
22	FWD			
23	FWD			